

How Cooperative Aerial Monitoring Can Contribute to Reducing Tensions Between India and Pakistan

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Abstract

This paper studies the possibility of establishing an understanding between India and Pakistan through “cooperative aerial monitoring” (CAM), a concept that draws from the success of the Sinai Agreement brokered in 1973 between Egypt and Israel, and the Open Skies Treaty (OST) of 1992. That historical groundbreaking document has contributed in large measure to increased transparency as a confidence building measure (CBM) between the North Atlantic Treaty Organization (NATO) and the erstwhile Warsaw Pact States. The implementation of a similar but suitably tailored bilateral agreement involving CAM by India and Pakistan can do much to lessen tensions that have plagued their adversarial relationship for over 50 years.

The possibility of misconstrued perceptions or accidents could exacerbate the ongoing impasse over Jammu and Kashmir (J&K) and add to tensions along the sensitive, fragile and overly militarized Line of Control (LOC) that could precipitate an unintended, unwanted nuclear exchange. The development imperatives of both countries and the exorbitant costs of maintaining and supporting a large number of troops in the most inhospitable terrain of the Siachen Glacier region place an enormous strain on already stretched-to-the-limit financial resources. Those resources could, and should, be invested in improving the lot of nearly a fifth of the world’s population.

Using historical precedents, the authors propose a course of military transparency based on minimum intrusiveness. The authors believe that, backed by positive civil and military will, CAM can be instrumental in constructing bridges of confidence and friendship. The authors hope that by adopting military transparency and various measures that have been mooted by others, success will be achieved in removing barriers of distrust caused by years of mutual suspicion.

Acknowledgments

The subject of cooperative aerial monitoring between India and Pakistan has been suggested over a period of years. In the fall of 2000, the Cooperative Monitoring Center (CMC) at Sandia National Laboratories suggested that a paper be written jointly by retired Air Force officers of the two countries. The concept was first raised with one of the authors during a breakfast meeting between US Ambassador Shirin Tahir-Kheli, Maj. Gen. M. Durrani of Pakistan, and Air Marshal Cariappa in January 2001. It was believed that implementing cooperation in aerial monitoring might help in reducing tensions and building confidence levels between the neighbors. Subsequently, invitations were extended to both authors to research the subject at the Cooperative Monitoring Center.

Our thanks are to Ambassador Tahir-Kheli for her efforts to get us together. To Kent Biringer, our friend, philosopher, and guide, goes our gratitude in keeping us focused and on track whenever there was a tendency to stray. We have had the good fortune in interacting with LTC Randy Parish United States Army (retd) who prepared the ground for us in compiling a very useful compendium on the Open Skies Treaty (OST.) From COL F.X. Stenger United States Air Force (USAF) (retd) of Defense Threat Reduction Agency (DTRA) and Mr. J. L. Rookard of the Open Skies Media Processing Facility at Dayton, Ohio, we received first-hand advice as to how things are actually done in implementing the Treaty's requirements.

Tom Budge from the Earth Data Analysis Center at the University of New Mexico interacted, briefed, and discussed the intricacies of aerial mapping and utilization of sensors. At short notice, he put together the many fine mosaics and maps in this paper. Mike Vannoni's paper on the Sinai Peace Accord and our discussions with him gave us a useful starting point for our own effort. Sally Bangora and Steve Garcia helped with preparing drawings and sketches. And, in putting together our joint effort, our thanks to Diane Ross, whose indefatigable patience in going through reams of paper made it easier for the reader to comprehend what we have written.

On the administrative front, we make our first acknowledgment to Eric Whitmore and the Institute for Public Policy at the University of New Mexico. Eric received us on arrival at Albuquerque and thereafter proceeded to ensure we were well settled. He then continued to attend to all our other requirements throughout our stay. However, once we were settled in at CMC, Patricia Dickens, Stephanie Sustaita, and Sandra Garcia took over to ensure that there were no glitches or roadblocks to upset our day. They did all they could to lighten our workload and to facilitate our functioning in every possible way. Finally, Ramona Tenorio made sure we wore our security badges and was always the first one to greet us when we got to work. To them all, we are deeply grateful.

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Acronyms

AFB	Air Force Base
Air HQ	Air Headquarters
CAM	Cooperative Aerial Monitoring
CBM	Confidence Building Measure
CCA	Consultative Committee of Arbitration
CMC	Cooperative Monitoring Center
FOV	Field of View
IB	International Border
INF	Intermediate-range Nuclear Forces
IRLS	Infrared Line Scan
J&K	Jammu and Kashmir
LOC	Line of Control
NATO	North Atlantic Treaty Organization
NTM	National Technical Means
OSCC	Open Skies Consultative Committee
OST	Open Skies Treaty
SAR	Synthetic Aperture Radar
SDI	Strategic Defense Initiative
UAV	Unmanned Aerial Vehicle
UK	United Kingdom
UN	United Nations
US	United States
USAF	United States Air Force
USSR	Union of Soviet Socialist Republics



Figure E-1. Political Map of South Asia

Executive Summary

The legacy of distrust, suspicion, and overt hostility between India and Pakistan has resulted in four wars that have not resolved any of the outstanding issues bedeviling their relationship. Instead, attitudes have hardened on both sides of the divide. This has resulted in militant religious and political elements surfacing to prominence in their respective domestic policies.

Tensions that existed between NATO and the erstwhile Warsaw Pact countries until the end of the 1980s were no less in magnitude. It was then that the US leadership realized that military “transparency” was necessary to defuse the situation and suggested ways and means to do so. Finally, the then-Union of Soviet Socialist Republics (USSR) accepted the idea of transparency that they termed “glasnost.” In 1992, this set the stage for initiating the Open Skies Treaty (OST) among 27 countries who subsequently proceeded to lay open their territories, stretching from Vancouver to Vladivostok, for the purposes of aerial observation. Preceding this “path-breaking” pact, bilateral Cooperative Aerial Monitoring (CAM) between Egypt and Israel, and Hungary and Romania had proved successful in reducing tension and in enhancing confidence building.

This paper proposes the application of existing models of CAM, albeit modified considerably, to India and Pakistan and hopefully with favorable results. This optimism is generated because international pressures and domestic realization have coalesced forcefully towards resolving long-standing and irritating conflicts, specifically in Jammu and Kashmir (J&K). Encouraged by Dr. Henry Kissinger’s incremental approach in solving the Egypt-Israel impasse by “nibbling” at major issues through small confidence-building steps, we have proposed that his successful strategy be applied in the Indo-Pak context.

Two powerful factors that today form the bedrock of confidence building are first, the existing “political will” as demonstrated by the present political leadership, and second, the long list of existing bilateral agreements that have been honored by both countries and have stood the test of time. In the prevailing situation, the institution of a CAM regime would have considerable advantages, such as:

- Monitoring military activity close to the border at low cost.
- Building a secure and stable security understanding between both countries.
- Reducing tension and suspicion.

The authors analyzed the terrain of the entire length of the Indo-Pak border to determine the applicability of the CAM regime (Figure E-1). Contentious areas such as the Siachen Glacier region and the Line of Control (LOC) were considered unsuitable for CAM initially because of the political sensitivities and the challenges in imaging the terrain. The Sir Creek region was also not selected initially because of the ongoing border dispute. However, CAM could be effectively carried out along the International Border (IB) from J&K to the Sir Creek. While recommending three small sectors along the IB, a small segment of 250 km of this border was

determined to be particularly suitable for conducting an experiment because it is not too militarily sensitive.

This paper also considers suitable platforms and sensors. The authors recommend that initially a Third Party aircraft be requested from the Open Skies Consultative Committee (OSCC) to conduct an experimental CAM flight. The entire series of steps (refer to the section on Methodology of Cooperative Aerial Monitoring) involves the aircraft to fly along the Indo-Pak border with observers from both countries on board. The on-board cameras would photograph a swath of territory 15 km on either side of the border (30 km total). Later, as confidence levels increase, the coverage could be extended progressively to 30 km and then to 60 km. These later missions could be flown using Indian and Pakistani aircraft modified for photographic missions and flown over their own territory with observers from the other side.

The authors have listed a set of recommendations to serve as a checklist. If CAM is applied by both India and Pakistan in a spirit of cooperation and with a will to succeed, various other military CBMs could be instituted. These may someday result in the lasting peace that has eluded the subcontinent for so long.

How Cooperative Aerial Monitoring Can Contribute to Reducing Tensions Between India and Pakistan

1. Introduction

The long-standing territorial dispute between India and Pakistan in Kashmir has been the cause for three major wars, and a very serious confrontation that could have led to full-scale war. This confrontation (known as the Kargil War) was fraught with the specter of a nuclear exchange. The legacy of distrust, suspicion, and conflict for over 50 years cannot be wished away nor can attitudes be mellowed overnight. However, the introduction of nuclear weapons into the equation has created a new sense of urgency to find ways and means to defuse the tension between the two belligerent neighbors.

The history of resolution of conflicts between India and Pakistan is unique because it does not follow patterns seen elsewhere. For example, ceasefire resolutions in India and Pakistan were not followed by proposals for serious disengagements to safe distances or for the creation of demilitarized zones. In some instances, the Indo-Pak agreements have been vague and incomplete, i.e., the Siachen issue is the creation of one such incomplete exercise of determining the Line of Control (LOC) under the Karachi Agreement of 1951. Essentially, on each ceasefire the troops pulled back to their original positions, retaining their weapons and maintaining eyeball-to-eyeball contact. This continued contact did not defuse tension; instead, hurt egos and a false sense of bravado exacerbated the situation. In contrast, in the aftermath of the Egypt–Israel War of 1973, Israeli forces withdrew to 20 km from the Suez Canal and a 10-km buffer zone was established between the opposing armies. Later, the Israelis pulled back to east of the Giddi and Mitla passes. A fresh buffer zone was then accepted, and was manned and monitored by United Nations (UN) peacekeepers and the United States (US) Sinai Field Mission. Henry Kissinger, the architect of the Sinai Peace Agreement, showed that an incremental approach towards solving serious disputes *without* tackling the fundamental issue can make significant progress and the overall political situation can improve as a result of benefits derived from relatively small steps. This method suggests that the major issue must be “nibbled at” and reduced in its magnitude. Using the same logic, even the J&K impasse could be resolved if small steps are taken as confidence building measures (CBMs). Within this context, the authors believe that the introduction of an incremental Cooperative Aerial Monitoring (CAM) regime rather than the full application of the Open Skies Treaty (OST) would bear meaningful results in the subcontinent.

In this paper, we make a case for the acceptance of a less-intrusive method of aerial monitoring while keeping in mind the sensibilities and sensitivities of the two countries. If this experiment succeeds, then a broader application of the CAM regime may be considered. It is hoped that as a collateral effect of military CBMs, mutual hostility and suspicion could be reduced, thereby building a basis from which a big step forward could be taken.

2. Precedents of Cooperative Aerial Monitoring

President Eisenhower first mooted the idea of “open skies” in 1955 to encourage bilateral transparency between the US and the USSR. However, the proposal was not acceptable to Premier Khrushchev who chose to keep the Iron Curtain drawn close around his country and the territories of his allies. This shroud of secrecy cost the two antagonists, North Atlantic Treaty Organization (NATO) and the Warsaw Pact States, trillions of dollars in an arms race.

The proposal was revived by President Bush in 1989 and was later expanded to include the satellite states of the Soviet Union. Gorbachev accepted the concept of overflights as a means of enhancing trust and creating transparency, which until then was conspicuous by its absence. The ensuing multi-national negotiations spread out over a period of many years and prolonged discussions resulted in the acceptance and signing of the OST.

Why did Khrushchev reject the OST in the first instance, and why did Gorbachev accept it? Perhaps because in the 1950s there was still great suspicion concerning US motives in the minds of Moscow’s rulers, whereas when the latter came to office, his policy of glasnost coupled with the economic collapse of the USSR had changed the political scenario. The hard realities of the time demanded pragmatism, astute leadership, and statesmanship, which Gorbachev was able to provide. Earlier, the Strategic Defense Initiative (SDI) as proposed by President Reagan had forced the Soviet Union into a corner economically, thereby exposing its lack of will to match the stakes. Dismantling the Iron Curtain soon commenced. Gorbachev was able to implement the Intermediate-range Nuclear Forces (INF) Treaty effectively and brought other arms control proposals to the discussion table. The US too, was keen on bringing Russia and Eastern Europe into the comity of nations. Thus, in this atmosphere of accommodation and understanding, the OST was proposed. It should therefore be apparent that an atmosphere of mutual suspicion and hostility can give way to one of trust and confidence if, as in the case of the US and the erstwhile Soviet Union, there is a change in the strategic relationship and a shared desire for peace.

The OST signed on March 24, 1992, established a regime of unarmed aerial observation flights over the entire territories of the 24 signatories (subsequently increased to 27 on December 15, 1992). The original signatories did not intend to confine the benefits of the Treaty only to NATO and the Warsaw Pact countries, but had hoped to enlarge its scope. It was conceived that the openness it demanded, and the mechanisms it created, could be made relevant to many more countries, thereby mitigating long-standing regional conflicts. It was designed to enhance confidence and mutual understanding by providing all participants, regardless of their size, the possibility of obtaining information on activities (military or others) of concern to them. Once the Treaty enters into force, all smaller States will receive copies of data obtained and may not be required to conduct their own flights. Currently, the Treaty covers the broadest geographical space from Vancouver to Vladivostok and is the most wide-ranging international effort to date to promote openness and transparency.

The Treaty is based on the following basic principles:

- Complete territorial access
- Use of unarmed reconnaissance aircraft
- Commercial availability of advanced sensor suites to all parties
- An annual quota of reciprocal flights

In case of disputes and differences, the Treaty allows for consensus decisions in the Open Skies Consultative Commission (OSCC). This mechanism also permits upgrading of sensors, adjustment of quotas, and admission of new participants.

There has thus far been just one example of a successful bilateral CAM regime, that between Hungary and Romania. Even as multi-national OST deliberations were in progress, Romania viewed the concept as an important step to reduce tension and build confidence with its neighbor Hungary. In January 1991, the latter responded to repeated Romanian initiatives to conclude the bi-national Treaty that was instrumental in reducing traditional hostility and tension that had existed for many years. Because both countries had the political will and courage to engage each other in promoting peace and confidence, the negotiating exercise was relatively simple. The main body of the document was agreed upon in a mere three days. This in turn proved that accepting the “open skies” concept had such advantages as:

- Enhancing the monitoring regime at relatively low cost.
- Creating stable and secure bilateral and regional security arrangements.
- Building a new cooperative security structure between Treaty partners.
- Satisfying tense and suspicious neighbors about each other’s intentions to respect international borders (IBs).

As stated earlier, the Sinai Agreements depended heavily on ground and aerial monitoring for verification. The participants of the agreements were allowed to fly their own reconnaissance aircraft up to their own forward lines to observe the latest positions. They were assisted by the US (in coordination with the UN) in periodic, high-altitude overflights. The Third Party information thus collected was shared selectively with Egypt and Israel.

3. Cooperative Aerial Monitoring in the Context of the Subcontinent

In the Indo–Pak context, the application of the CAM concept begs two questions:

- Is it necessary to achieve a political understanding before CAM negotiations can take place?
- Will the implementation of CAM result in the necessary political accommodation and understanding?

Political will is a prerequisite for any understanding even if it is an experiment in CAM. Fortunately, this will does exist, as was evident when the Indian Prime Minister visited Lahore in February 1999. This was followed by a summit between him and the Pakistani President in July 2001. Both leaders agreed that there should be more meetings and that the dialogue would continue in order to resolve disputes. During a press conference in Agra in July 2001, President Musharraf of Pakistan stated quite unequivocally that there was no military solution to the Jammu and Kashmir (J&K) imbroglio. He said answers would have to be found through negotiations. On September 6, 2001, Prime Minister Vajpayee of India reiterated that his government was optimistic about a negotiated settlement over the J&K impasse. At a national police convention (as reported by the Pakistani *Dawn*), he said, “It remains our hope that dialogue alone can build mutual trust and understanding and help us arrive at a negotiated settlement over various bilateral issues, including Kashmir.”

As a matter of interest, after Reagan and Gorbachev had agreed in principle to the reduction of nuclear weapons, it did not take long for their respective technical and diplomatic experts to work out the INF Treaty in 1987. However, hammering out details of the OST was a lengthy and involved process because of inherent suspicion and distrust and because of the large numbers of participants.

To facilitate matters in the subcontinent, there are already some confidence building mechanisms in place, which include:

- Prohibiting Attacks against Nuclear Installations and Facilities – 1988
- Advance Notice on Military Exercises, Maneuvers and Troop Movements – 1991
- Prevention of Airspace Violations and Permitting Over-flights and Landings by Military Aircraft – 1992
- Joint Declaration on the Complete Prohibition of Chemical Weapons – 1992

Other non-military landmark Treaty achievements include The Indus Waters Treaty (September 19, 1960) and the Agreement on the Salal Hydro-Electric Plant (April 14, 1978) ¹.

¹ *Crisis Prevention, Confidence Building and Reconciliation in South Asia*. Edited by Michael Krepon and Amit Sewak, published by the Henry L. Stimson Center, Washington, D.C., 1995.

This list is by no means exhaustive. With a fairly impressive track record of earlier CBMs to resolve differences amicably, and the honoring of those decisions, there is no reason why another such measure of equal importance cannot be considered for adoption. The mechanics of a CAM regime are therefore being introduced in the belief that it will have far-reaching and positive consequences for the subcontinent.

The emphasis of CAM would be *transparency* and **not** *intrusive intelligence gathering*. The authors purposely selected the equipment and operating procedures in order to achieve the desired balance between transparency and intrusiveness. The use of common equipment and operating procedures would limit photo acquisition capability. In the future, such flights could be used as a means to monitor force levels should both countries agree to restrict, formally or informally, troops and equipment deployment within specified geographical areas. Thus, some CBMs that could emerge as a result of CAM are:

- Disengagement of troops to a distance of 30 km in the first phase, and once confidence levels increase, to 60 km in the second phase. These distances have been recommended keeping in mind the “footprint” of the cameras that are being proposed for the aircraft engaged in aerial monitoring missions.
- Establishment of limited force zones within the disengagement/demilitarized areas of 30 km and 60 km respectively.
- The non-deployment of missiles within the stipulated zones.
- Demilitarization of the Siachen area and Sir Creek.

It is the authors’ belief that with the institution of a CAM regime, army formation commanders, particularly those with sensitive equipment, would themselves suggest the withdrawal of their forces further away from the “prying eyes” of the aerial monitoring sensors.

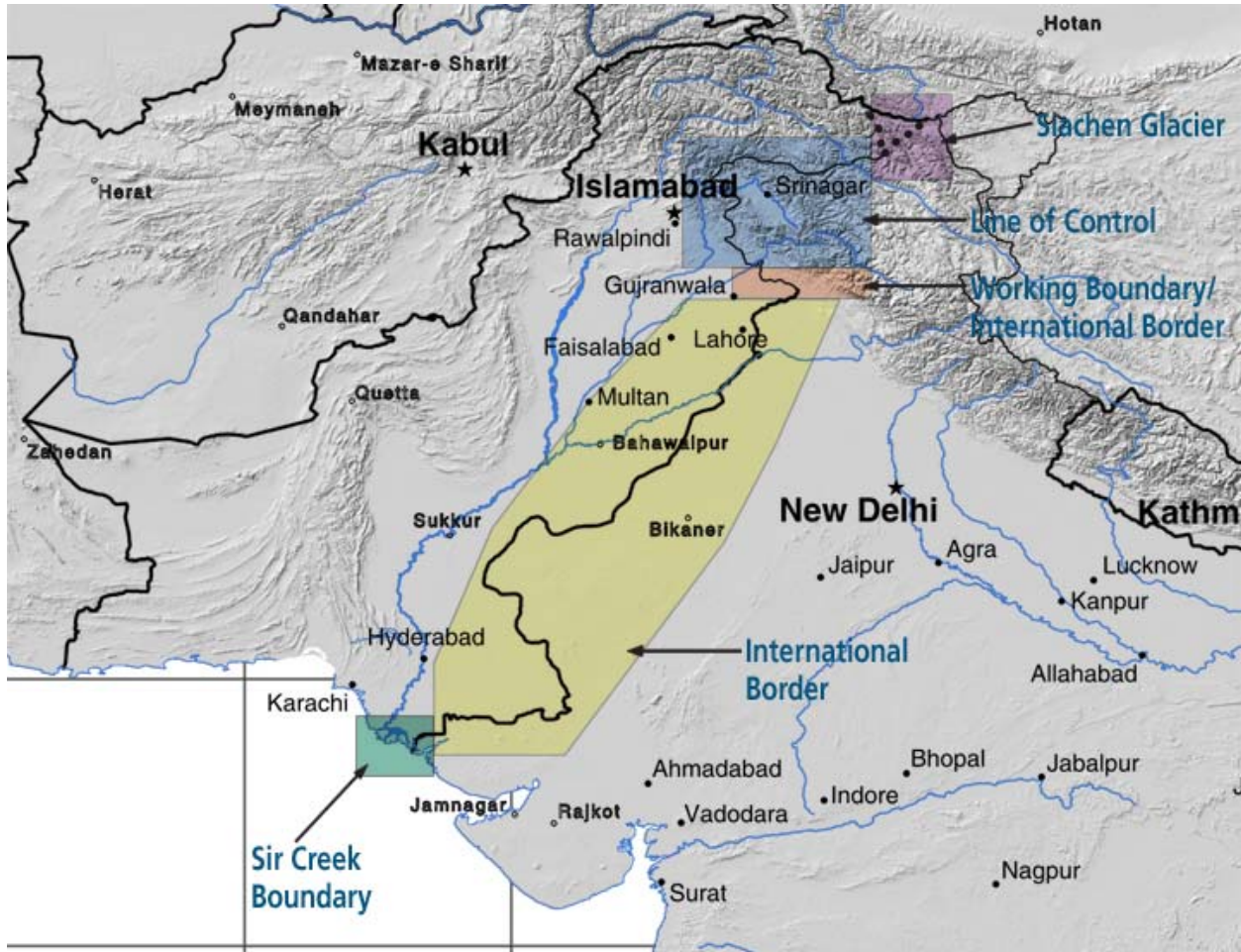
4. Terrain Analysis for Application of Cooperative Aerial Monitoring

Despite the availability of a wide variety of technological ground-based sensors, very few can be placed along the most contentious stretches of the Indo-Pak border. The demarcation between the two countries lies along some of the most inhospitable and inaccessible tracts of the towering Himalayas. Nearly 110 km of this border lie at heights varying from 15,000 ft and 25,000 ft. Perpetual snow, blizzards, avalanches, sub-zero temperatures, and impassable terrain preclude normal human activity. Yet, in areas where access is possible, troops of the two nations have, through extraordinary effort, established pickets and fought one another in what is known as the highest battlefield in the world.

For the purposes of establishing a CAM regime, the authors propose to divide the entire 3200 km border into segments starting from the northern reaches of the Siachen Glacier to the southernmost tip of the Indo-Pak land border at Sir Creek (see Figure 1). This is necessitated because of the differences in terrain, not all of which lends itself to accurate or definitive photo reconnaissance, or for the use of other sensors. The segments could be described as follows:

- Siachen Glacier Region north of grid reference point NJ 9842
- The Line of Control stretching southwards from NJ 9842 to grid reference point NW 6565
- The J&K International Border (India's term)/Working Boundary (Pakistan's term)
- International Border (IB) to Sir Creek
- The Sir Creek estuary

The following sections describe the terrain along the entire Indo-Pak border and the applicability of suggested cooperative monitoring solutions based on earlier papers produced at the Cooperative Monitoring Center (CMC.)



*Figure 1. Division of Indo-Pak Border into Terrain-Based Sectors
for Considering a CAM Regime*

4.1. The Siachen Glacier Region

Steep and towering mountain ridges running generally north and south rising to heights above 25,000 ft characterize the glacier region commonly known as Siachen (Figure 2). The salient feature is the Siachen Glacier that stretches approximately 70 km. This is a region of perpetual, blinding snow and ice. Gale force blizzards induce an extremely low wind chill factor that further lowers temperatures below the ambient minus 40°C. The nearly vertical mountainsides and deep declivities make for inaccessible approaches to the ridges or the peaks.

Analysis

Given the nature of the hostile physical and climatic conditions, the possibility of any kind of cooperative aerial monitoring can be ruled out. Even such sophisticated sensors as synthetic aperture radar (SAR) and infrared line scanners (IRLS) have limited use. In the circumstances, it is recommended that establishment of a scientific and meteorological monitoring

center at a suitable location near the glacier be considered and the area be demilitarized.² Another factor that must be considered is that this is a combat zone and as such could be excluded from an aerial monitoring regime, more so if the idea of a scientific center is accepted.

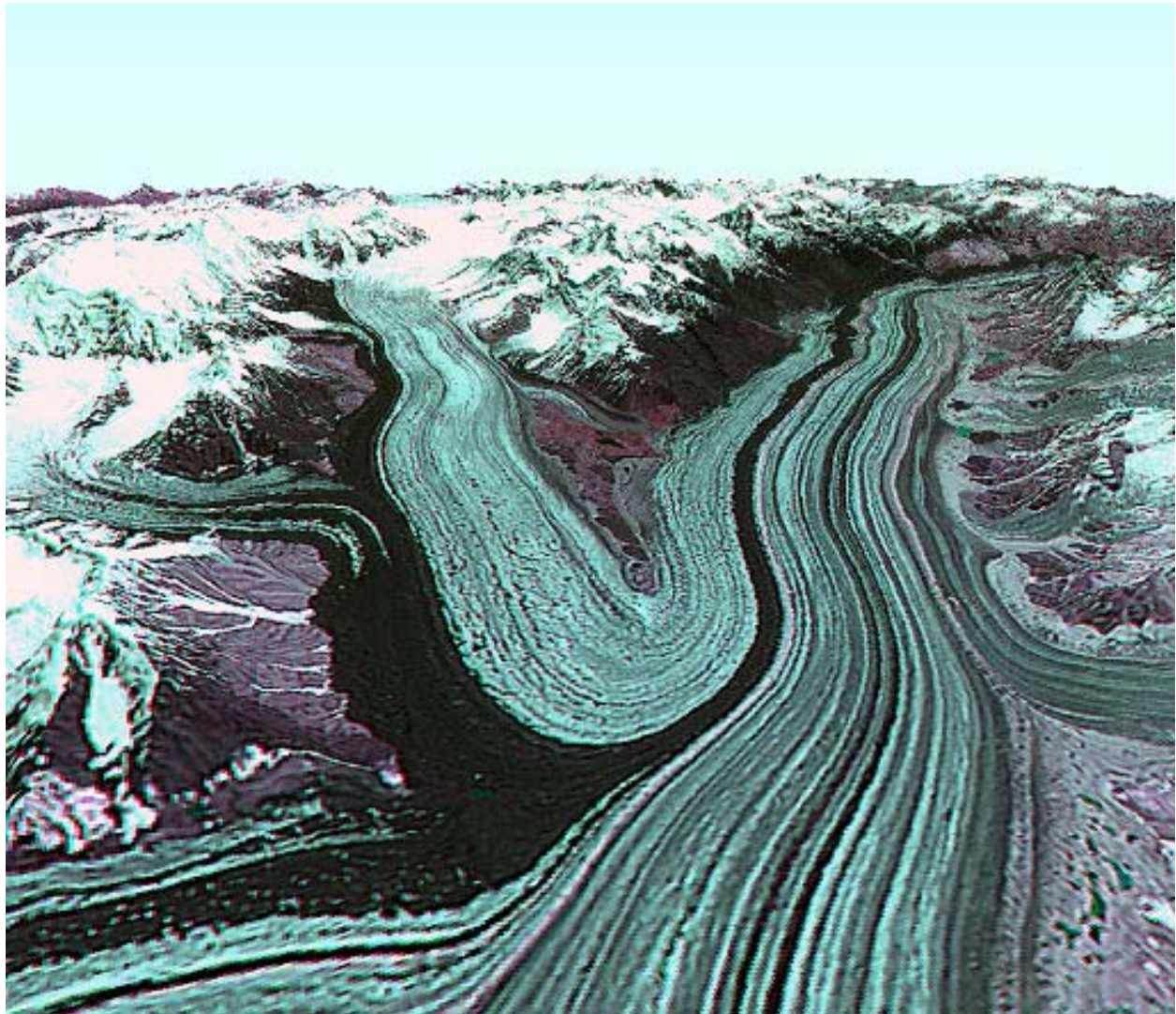


Figure 2. Computer-Generated Terrain Map of the Siachen Glacier Region

² Kent L. Biringer, *Siachen Science Center: A Concept for Cooperation at the Top of The World*, CMC Occasional Paper 98-0505/2, Sandia National Laboratories, Albuquerque, NM, March 1998.

4.2. Line of Control

This demarcating line starts from NJ 9842 and heads in a generally southwesterly direction. The area is mountainous with peaks rising to approximately 20,000 ft in the NE with height reducing to about 5,000 ft progressing southwestwards. The tree line extends to about 8,500 ft and the mountain slopes are thickly wooded. Above that height, the terrain is rocky and very steep in many places. Climatic conditions are neither as severe, nor as hostile as in the glacier region; however, freezing temperatures prevail during winter.

Analysis

The terrain and dense foliage make aerial monitoring impractical. In the circumstances, installing ground monitoring equipment as suggested by Maj. Gen. Durrani³ is recommended. Further, as this too is a contentious area, at least until the J&K issue is resolved, no aerial monitoring is proposed in this area. (See Figures 3, 4, and 5.)

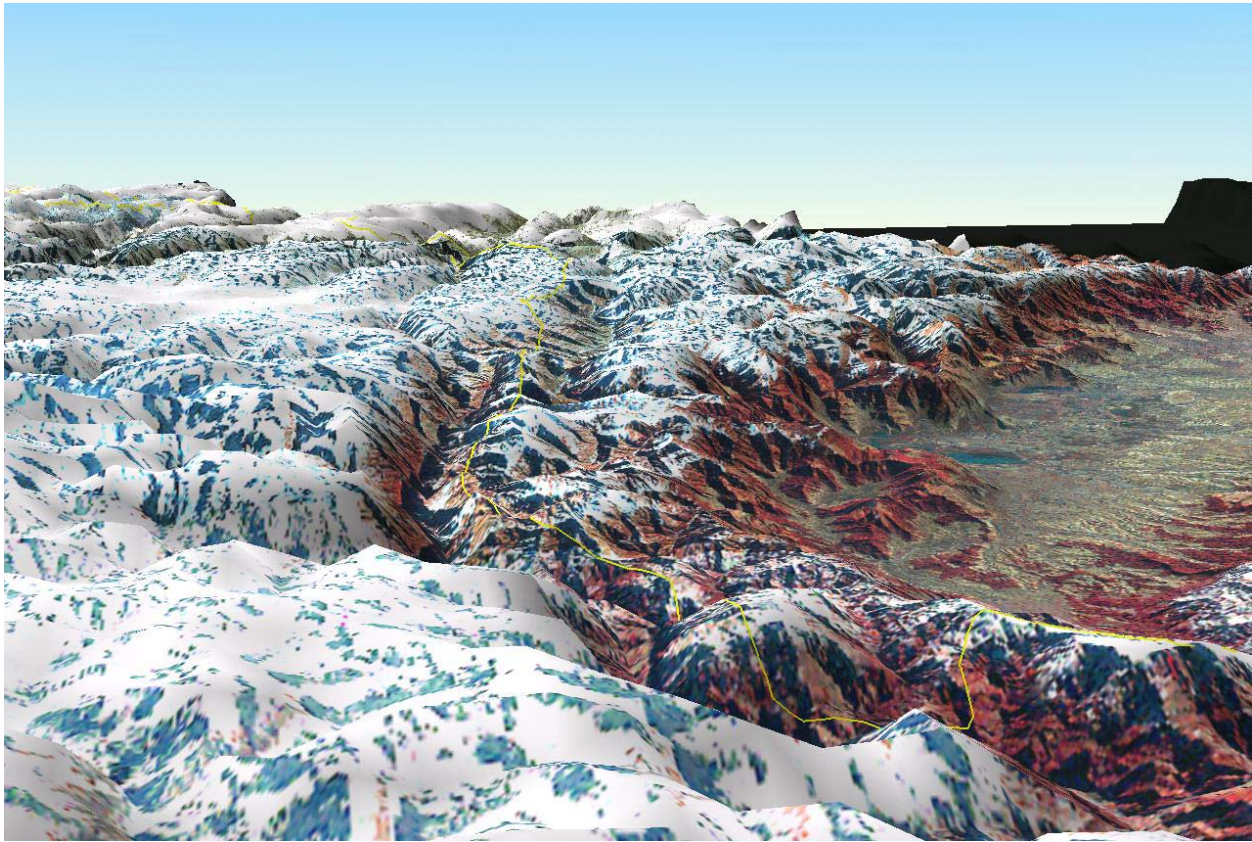


Figure 3. Computer-Generated Terrain Map Looking Northeast Along the Line of Control in Kashmir

³ Major General Mahmud Ali Durrani (Retd), *Enhancing Security Through a Cooperative Border Monitoring Experiment: A Proposal for India and Pakistan*, Cooperative Monitoring Center Occasional Paper SAND 98-0505/21, Sandia National Laboratories, Albuquerque, NM, July 2001



*Figure 4. Destroyed Bridge on the Muzaffarabad-Srinagar Highway
at Chakothi Along the Line of Control*



*Figure 5. Chakothi-Uri Sector Terrain (Jhelum River at left, India at right)
Along the Line of Control*

4.3. J&K International Border/Working Boundary

The border region of Jammu and Kashmir (Figure 6) is referred to as the J&K International Border (by India) or the Working Boundary (by Pakistan) and is characterized by generally lower terrain, wooded hill slopes, and hilltops reaching to about 5,000 ft. The height decreases progressively as the border turns to a southerly/southeasterly direction. The climate and weather conditions are less severe than in the contiguous northern regions. The foothills lower into the plains that slope towards the major rivers that then join the mighty Indus at various points along its course. A combination of ground sensors and aerial monitoring could be put in place to provide confidence building measures along this segment of the border.

Analysis

This is the commencement of the plains area of the border, and renders itself entirely suitable to electronic/optical monitoring. Though there is considerable military activity in the area, at some future time it could come under the ambit of the monitoring agreement.

4.4. The International Border (IB)

This border (extending from that described in the preceding section) runs in a generally SSW direction with a median height of about 750 ft, lowering to sea level as it approaches the Sir Creek estuary. The northern areas of this region experience hot summers (45°C) and cold winters with the temperature touching 0°C. The Great Thar Desert is easily the dominating feature of the area where temperatures rise to above 50°C. This undisputed and internationally recognized section of the border has large forces deployed in defensive positions and in depth on both sides of it. Because of the absence of high hill features, it is most suitable for aerial observation. Numerous airfields on either side of the border with the required infrastructure could support a CAM regime. To identify candidate experiment locations, this segment could be further subdivided to identify a length of border where, because of the terrain and harshness of climate, there is neither habitation nor any areas of military significance, and therefore of little security sensitivity.

Analysis

Because of the flat terrain, this area is highly suitable for conducting optical/electronic aerial monitoring. It would therefore be ideal for putting in place a preliminary monitoring regime. A practical experiment could be modeled and put in place in a small segment of this border.

How Cooperative Aerial Monitoring Can Contribute to Reducing Tensions Between India and Pakistan

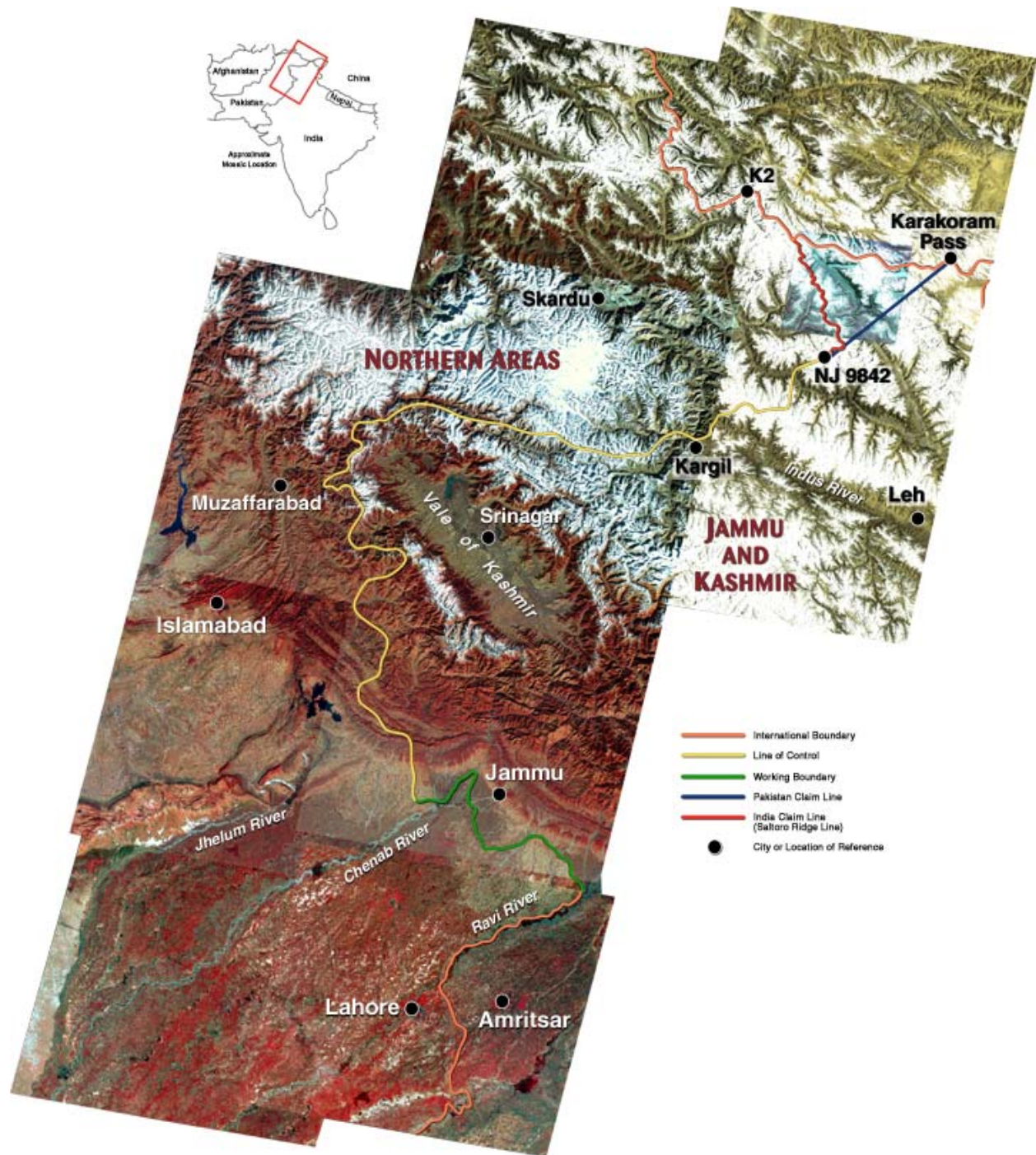


Figure 6. Composite Satellite Map of Jammu and Kashmir Region

4.5. The Sir Creek

As the border moves further south, it enters the Rann of Kutch terminating in a 60-mile-long riverine estuary known as the Sir Creek. It is flat and featureless with salt flats that are marshy and devoid of any vegetation; however, they are home to large flocks of flamingos and herds of wild asses. Demarcation of this portion of the border has been difficult because of varying interpretations by both countries. A minor conflict erupted here in April 1965. Despite international arbitration, differences remain unresolved. A.G. Noorani has made some recommendations⁴ to settle the dispute. Also, Occasional Papers authored at the CMC⁵ have suggested de-militarization in the first instance and then the institution of a confidence building CAM regime.

Analysis

Although the flat terrain renders it perfectly suitable for aerial monitoring, the limited presence of military units makes it more suitable for another kind of cooperation. As in the case of the Siachen region, a proposal of establishing a joint Indo-Pak venture to study pollution, water quality and currents⁶, and other studies concerning marine biology⁷ may be considered.

⁴ *Easing the Indo-Pakistani Dialogue on Kashmir: Confidence Building Measures for the Siachen Glacier, Sir Creek, and the Wular Barrage Disputes*. A.G. Noorani, Occasional Paper #16, The Henry L. Stimson Center, Washington, D.C., April 1994.

⁵ *Maritime Cooperation Between India and Pakistan; Building Confidence at Sea*, Ayesha Siddiqua-Agha, Cooperative Monitoring Center Occasional Paper SAND 98-0505/18, Sandia National Laboratories, Albuquerque, NM, November 2000.

Reducing Risk in South Asia: Managing India - Pakistan Tensions, Shirin Tahir-Kheli and Kent L. Biringer, Cooperative Monitoring Center Occasional Paper SAND 98-0505/20, Sandia National Laboratories, Albuquerque, NM, March 2001

⁶ *The South Asia Cooperative Environmental Monitoring Project: An Effort to Promote Regional Cooperation and Water Quality Data Sharing in South Asia*. Gaurav Rajen, Kent L. Biringer, and J. David Betsill, Sandia National Laboratories, Albuquerque, NM, SAND2001-0722, March 2001

⁷ *Cooperative Environmental Monitoring in the Coastal Regions of India and Pakistan*, Gaurav Rajen, Sandia National Laboratories, Albuquerque, NM, SAND 98-0505/11, June 1999

5. Basic Mechanisms and Tools for CAM

Some fundamental requirements are essential for the conduct of CAM between participants. These include aerial platforms, sensors, and processing facilities. Also, a committee or a commission would need to be established to broker agreement on issues such as the type of sensors to be used and the desired level of resolution and for reconciling disputes. Possible platforms and applicable sensors for cooperative aerial monitoring are discussed in the following sections. Various national technical means (NTM) through which both sides are indulging in reconnaissance and intelligence-gathering operations are not relevant to this discussion.

5.1. Platforms

Aerial platforms that are presently available for aerial monitoring purposes in the inventories of India and Pakistan are:

India

- An-32—A twin-engine turboprop aircraft of Russian manufacture (Figure 7).
- Dornier 228—A 12- to 14-seat capacity twin-engine turboprop aircraft of German origin.
- Mi-17 Helicopter—A twin-engine helicopter of Russian manufacture capable of high-altitude operations.



Figure 7. An-32

Pakistan

- C-130 Hercules—A four-engine turboprop aircraft of US manufacture (Figure 8).
- Fokker F-27—A twin-engine turboprop aircraft of Dutch manufacture.
- Mi-17 and Puma Helicopters—Twin-engine turboprop helicopters of Russian and French manufacture respectively. Both helicopters are capable of high-altitude operations.



Figure 8. C-130 Hercules

5.1.1. Aircraft

The An-32, Dornier 28, C-130 Hercules, and Fokker F-27 are being suggested because they are high-wing transport aircraft on which cameras and sensors could be fitted easily, have adequate range/endurance and could carry the requisite number of operators/observers for the monitoring mission. In the event that sensor modification is considered too expensive and time-consuming, initial experimental flights could be flown with the assistance of a Third Party whose aircrew are trained in the role, and whose aircraft have been modified for Open Skies missions. Among countries that have the expertise and could be approached for support are Canada, Hungary, Romania, United Kingdom (UK), US, and USSR.

5.1.2. Helicopters

The Mi-17 and Puma helicopters that are being proposed meet the requirements of carrying sufficient numbers of personnel as observers or hosts. Because these machines are prone to vibration, they are not considered suitable for photo-reconnaissance missions of the type envisaged for CAM missions. They could be used ideally where visual observation is required in such areas as the LOC and Siachen.

5.1.3. Aerostats

These tethered, helium-filled balloons are equipped to carry a combination of aerial surveillance technologies. Precise operational characteristics vary considerably depending on payload, altitude, power source, and the sensor equipment suite. A major vendor claims that the aerostat is “an ideal platform for long-range, electro-optical/infrared suites and other sensing equipment.” However, most such platforms deployed along the US-Mexican border and the one with a television transmitter in Florida have not lived up to claimed capabilities in tracking drug-

runner aircraft⁸. On the other hand, it is claimed that a Westinghouse aerostat deployed with TPS-63 radar at 10,000 ft on the Kuwaiti border was able to acquire aircraft on the take-off roll on runways in Iran! It was also able to detect the massed armor used by Iraq as a prelude to its offensive against Kuwait⁹. Thus, while the equipment did prove its worth, the US\$25 million unit cost is exorbitant in the South Asian context. A major constraint to the deployment of these balloons is that they are susceptible to being damaged or to breaking their moorings in case of strong winds, or other weather phenomena. Further, used in aerial reconnaissance, only a small section and a fixed location can be monitored. In these circumstances, they are not considered suitable for deployment in a CAM role even if information could be transmitted to operation centers some distance away.

5.1.4. Unmanned Aerial Vehicles (UAVs)

Considerable financial savings could be effected if aerial monitoring is done by UAVs. These craft are capable of supporting a variety of sensors and operate at considerable altitudes. The newest additions to the US inventory are “Predator” and “Global Hawk,” both of which have phenomenal performance capabilities at great heights (25,000 ft to 100,000 ft), and endurance ranging from 4 to 24 hours¹⁰. They carry optical and electronic sensors and can transmit data in real time. A major constraint because of the line-of-sight requirements is the necessity of establishing a chain of monitoring/controlling stations. Other important factors to be considered are weather, endurance, and payload. However, what is likely to be the most important consideration in recommending their use is whether US and Israeli state-of-the-art technology would be released for requirements in the subcontinental context. For purposes of this study, the availability of these platforms could be ruled out.

5.2. Imaging Sensors

5.2.1. Cameras (Optical/Electro-optical/Video)

Despite the availability of more capable and “smarter” sensors, OST signatories have preferred the use of simpler and comparatively inexpensive surveillance cameras that are tailored to provide the required degree of image resolution and area coverage (footprint) from a specified altitude. For example, the KA-91 is one such camera that gives the desired result of a 15 km swath while flying at an altitude of 7 km (23,000 ft). A combination of KA-91 (vertical) and KS-87 (oblique) cameras can provide greater swath width, but the altitude at which the platform operates will have to be lowered to meet the resolution requirements of the KS-87 camera (see Figure 9). The right combination of altitude and camera would have to be determined by the professionals to give the desired swath width. Most cameras available in the market can obtain the OST-stipulated resolution of 30 cm. (Resolution is a function of the optical system selected, the film type and processing, and the altitude of the aircraft.) The area covered by an image (the

⁸ *Tethered Aerostat Radar System* at www.fas.org/nuke/guide/usa/airdef/tars.htm, Federation of American Scientists, Washington, D.C.

⁹ “Tethered Aerostat Alerted Kuwait to Iraqis Heading Across Border,” Bruce D Nordwell, *Aviation Week and Space Technology*, Sept. 24, 1990, Volume 133, No. 13, p.21.

¹⁰ *Jane's Military Aerospace Jane's Defence Weekly*, March 11, 1998.

footprint) would in turn determine the number of flights required to image an agreed area. It is pertinent to state that India and Pakistan have some aerial NTM capabilities that can provide them with resolution better than 30 cm from ranges of up to 45 km.

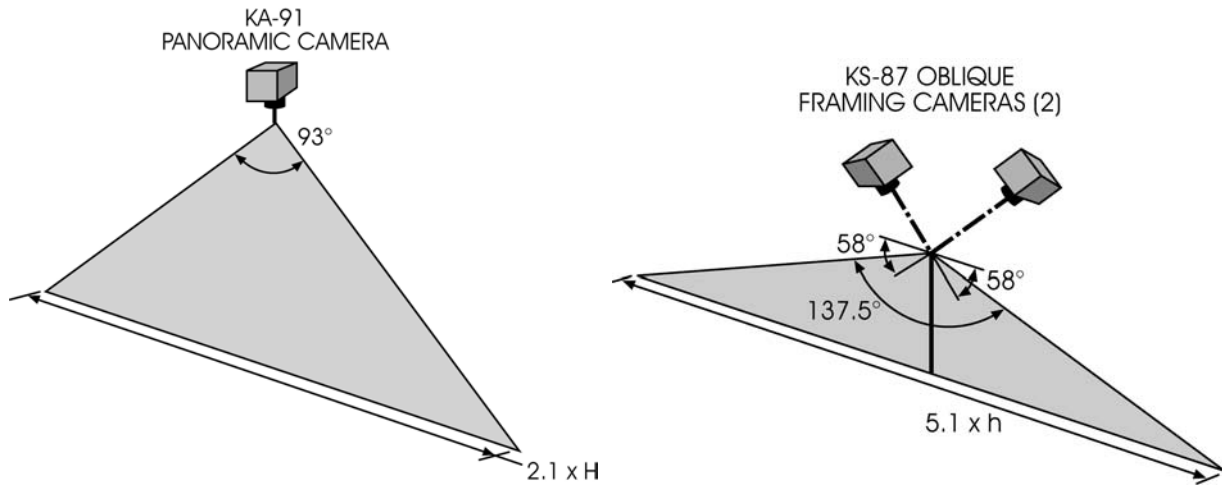


Figure 9. Representative Coverage Areas for Two Types of Optical Sensors

A resolution of 30 cm means that to be detected, two objects must be at least 30 cm apart, or of 30 cm or more in dimension. In practical terms, this resolution would permit distinguishing between an armored fighting vehicle and a truck, thus indicating the presence or otherwise of specific military formations within the area to be monitored. Thus, transparency would be assured with a minimum degree of intrusiveness. Some video cameras can provide the same 30-cm resolution at a lower height; however, these are not considered suitable because of their narrow field of view (FOV), thereby requiring multiple passes to cover a given area. (See Figure 10.)

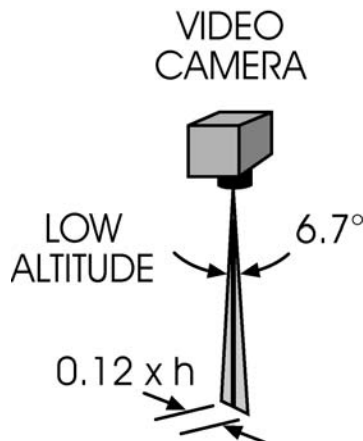


Figure 10. Coverage Available with Open Skies Video Camera

5.2.2. Infrared Line Scan (IRLS) and Synthetic Aperture Radar (SAR)

Infrared sensors can achieve resolutions as good or better than that of cameras. But, because of the narrow FOV (as in the case of video imaging), numerous runs are required to obtain coverage of a large area. These sensors are effective for day or night imagery but depend on good weather conditions. SAR is very efficient at obtaining imagery in all weather and varying light conditions, or even when atmospheric obscurants are present. However, data interpretation is difficult and requires specialists to do the analysis.

In any case, despite obvious and well-known advantages, these sensors are not being considered for use in this proposal. Even though the OST provides for the use of IRLS and SAR, the signatories are not yet using these means. The sensors have known technical difficulties, high expense, and may have export restrictions. Also, in the Indo-Pak context, the principle of least intrusiveness discourages their use at this stage.

5.2.3. Processing of Information

On completion of a monitoring flight, the film would be removed from the camera, placed in sealed containers to prevent tampering, and transported to an agreed processing facility. Depending on whether the “observed” or the “observing” party processes the film, the OST allows either three days or 10 respectively to develop and duplicate all film used in the course of the mission. The processing must be done in the presence of both parties. If only one camera is used, then two sets of negatives/prints would need to be produced, one each for delivery to the representatives of each country. This would guarantee the availability of identical raw information and therefore a common base for discussions on observations between the two Parties. All cameras are film-based and not digital because the latter can be more easily manipulated.

Film processing facilities could be established either independently or jointly by both India and Pakistan. Guidance and assistance could be sought from the Open Skies Media Processing facilities at Wright-Patterson Air Force Base (AFB), USA, a designated OST airfield.

6. Methodology of Cooperative Aerial Monitoring

The OST has been used as the basis for proposing the concept of CAM to be implemented between India and Pakistan. The sensitivity of their rather tenuous relationship has necessitated that a model be designed keeping in mind their basic requirements of minimum intrusiveness, yet fulfilling the necessity of maintaining transparency. To achieve this aim a practical and flexible series of steps is proposed and discussed as a possible course of action.

6.1. Planning

Initial steps would be conducted independently by each country. Preliminary meetings conducted independently by the Ministries of Foreign/External Affairs, Defense, and the Armed Forces of both countries would be required. These meetings would produce a statement that would be used to convince the political leadership that agreeing to a CAM regime would not compromise national security, but would in fact enhance it. Aerial surveillance of the type being proposed would not be used as an instrument of intelligence gathering. In order to produce a comprehensive document, the OST and a plethora of other papers dealing with the subject could be used as references. The paper would point out that, despite the availability of highly advanced technology, OST signatories have agreed to the use of medium performance optical sensors (30 cm resolution) to assuage sensitivities about security.

6.2. Study of Ongoing OST Operations

Representatives of India and Pakistan could visit a suitable OST airfield where planning procedures and mission parameters can be studied. Thereafter, they could accompany an Open Skies mission to learn first-hand how missions are conducted and how information is processed and shared. One candidate facility is the Wright-Patterson AFB, Dayton, Ohio, USA. It is understandable that India and Pakistan may not join the OST as full members because of their sensitivities regarding security of information. However, observer status is desirable in order to avail technical assistance and other advisory aspects. This status would also help them through their bilateral discussions and in the formulation of a subsequent agreement on CAM.

6.3. Evolving Bilateral Agreement for Experimental Flight

Having familiarized themselves with Open Skies missions and other modalities, experts from India and Pakistan could hold joint discussions to evolve a bilateral agreement to enter an experimental CAM arrangement. Assistance could be sought from the Open Skies Consultative Committee (OSCC) if desired. Some aspects that would need to be covered during the course of deliberations are:

- Scope and area to be monitored
- Type of aircraft to be used
- Flight planning

- Sensors and processing of data obtained
- Schedule and preparation of the experimental observation flight

6.4. Conducting the Experimental Flight

Because of sensitivity in the region, a limited CAM experiment is being suggested for mutual confidence building. Three geographic areas are proposed initially in order of priority and suitability. (See Figure 11.) However, both countries would mutually be the final arbiters in deciding where exactly the task could be carried out.

- 1) From a line joining Munaba (Pakistan) and Gadra Road (India) to a line joining Jati (Pakistan) and Lakhpat (India) over a distance of approximately 250 km. This is a sparsely populated region where there is limited military activity and therefore low sensitivity.
- 2) From a line joining Fort Abbas (Pakistan) and Anupgarh (India) to a line joining Sadiqabad (Pakistan) and Kishangarh (India) over a distance of approximately 300 km. This is generally desert terrain, but has some tactical sensitivity.
- 3) From a line joining Sadiqabad (Pakistan) and Kishangarh (India) to a line joining Munaba (Pakistan) and Gadra Road (India) over a distance of approximately 400 km. This is also desert terrain and may be viewed as being militarily sensitive too.

At this stage of the experiment, an aircraft would fly over and along the border, photographing a swath of 15 km on either side of the border (30 km total). See Figures 12 and 13. One or more runs would be required to achieve the desired coverage. (See Figure 14.) Subsequently, and if viewed favorably, similar missions could be flown within the borders of each country to a depth of 15 km, photographing a width of 30 km within the recommended sector. With the passage of time, enhanced confidence levels, and increased trust, the coverage of such missions could be increased to 30 km from the border. The experimental mission would involve availing of the facilities of a suitably modified aircraft belonging to a Third Party made available by the OSCC. This suggestion is being mooted because of the known availability of such aircraft and the fact that both time and expenses would be saved where India and Pakistan are concerned.

6.4.1. Suggested Airfields

For the purposes of these trial flights, Ahmedabad, India, and Shara-e-Faisal Karachi, Pakistan, could be designated as preparation and launching bases. However, since these flights are being conducted for the first time ever, it is proposed that the initial briefings be carried out in New Delhi and Islamabad, respectively, designated as Prime Airfields where visiting aircraft could arrive and depart. This would facilitate briefing prior to the mission and debriefing after it near Air Headquarters (Air HQ) of both countries. At the end of the experimental flight(s), the aircraft would refuel at the launching base before proceeding to the Prime Airfield, where photo-processing facilities would be available. The processed photographs would then be made

available quickly to military and political leadership for their study and further briefings as necessary.

6.4.2. Administrative Requirements

Obtaining security clearances, visas, and providing other administrative necessities of the visiting air and ground crew and observers would be the responsibility of the host nation.



Figure 11. Suggested Sectors for Proposed CAM Experiment

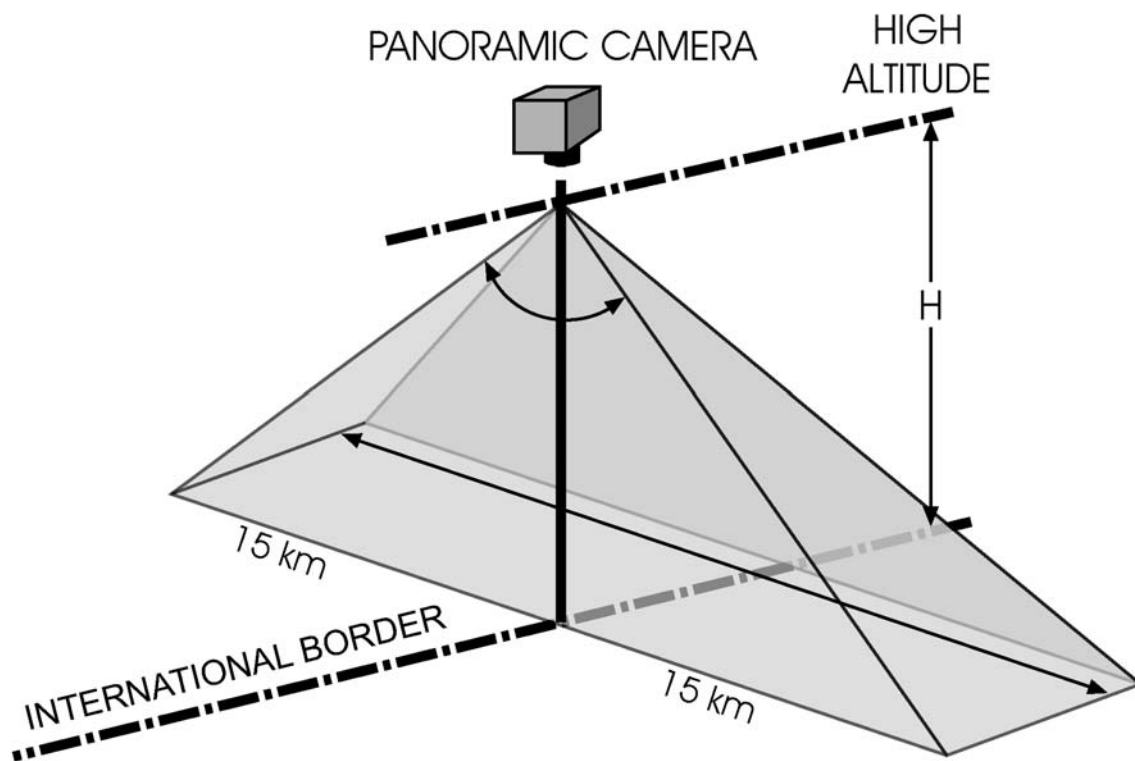


Figure 12. Typical Camera and Coverage Footprint for Experimental Flight

6.4.3. Inspection and Calibration

Technical personnel from the host nation and the observers would conduct an inspection of the aircraft and on-board sensors to satisfy themselves that equipment conforms to the requirements of the agreement in terms of intrusive characteristics of the latter. The owner of the third-party aircraft would calibrate the sensors to meet requirements for the desired degree of resolution.

6.4.4. Flight Planning and Conduct of the Mission

Details of these aspects would have to be decided by respective Air HQ. Routes to and from the designated airfield would then have to be discussed with the aircrew of the Third Party. In similar vein, the routes to and from the designated starting/terminating points on the border would have to be worked out and made known to all participating personnel. Both parties need to notify their respective air defense commands and troops on the border to avoid jeopardizing the safety of the mission.

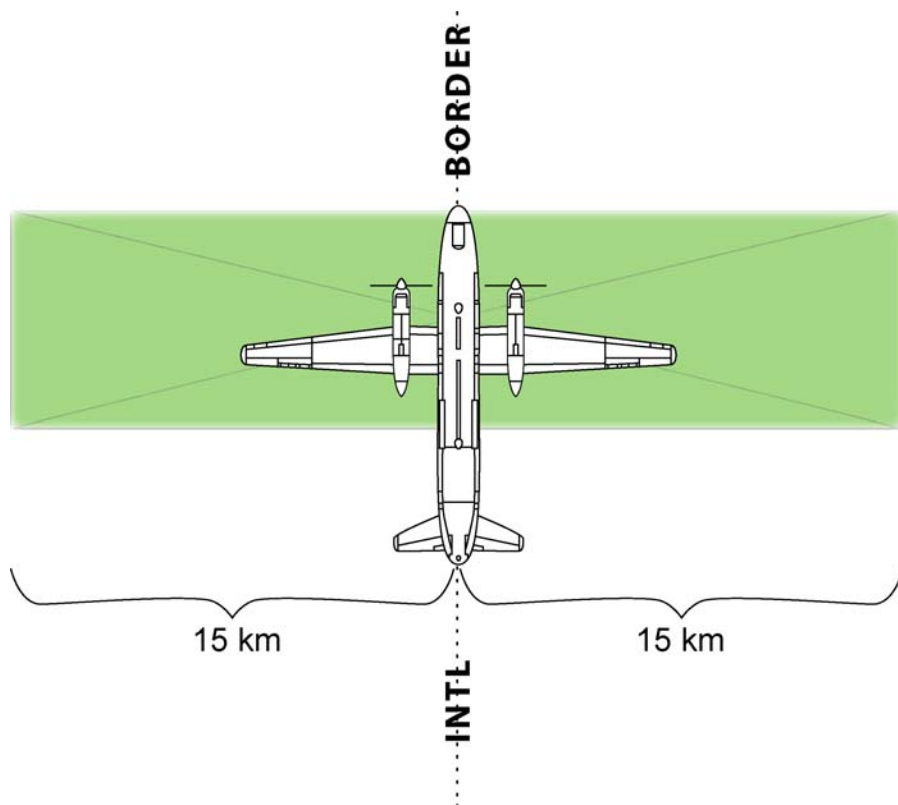


Figure 13. Flight and Coverage Profiles for Experiment and Expanded Monitoring

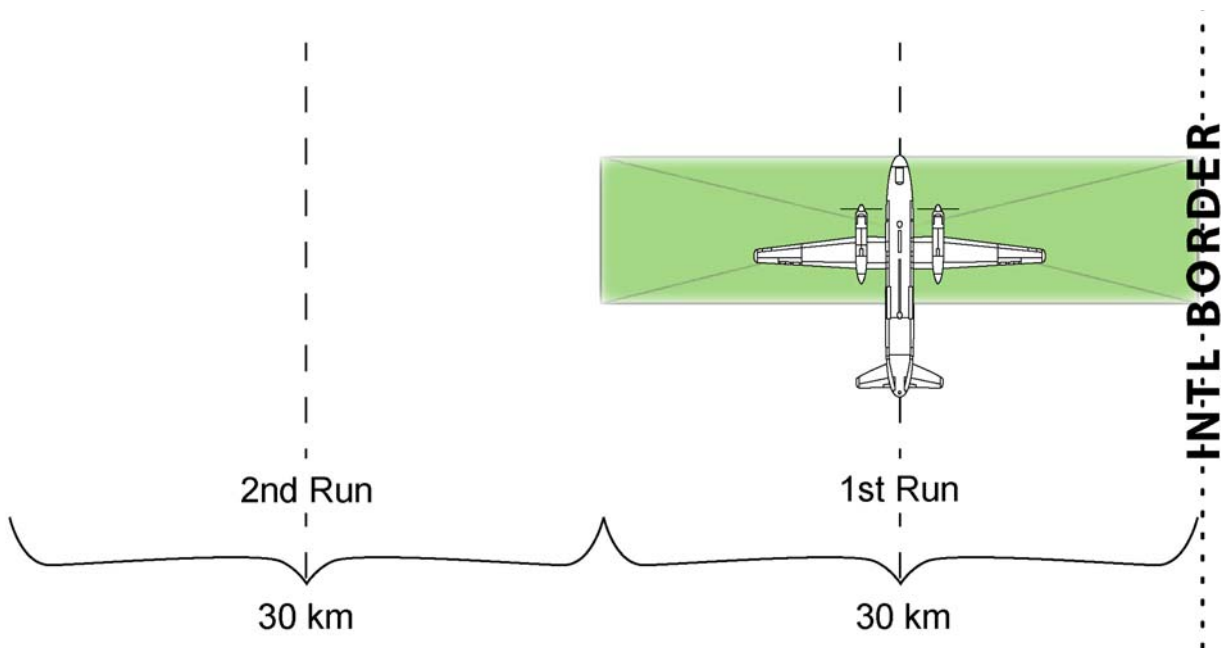


Figure 14. Achieving 60-km Coverage with Two Overflights

6.4.5. Timeframe for Conduct of the Mission

Both countries need to agree to when the experimental or trial flight could be conducted, depending on the availability of the Third Party aircraft, the weather, and when convenient to both countries.

6.4.6. Educate the News Media

A most important factor that can influence the success or failure of a proposal is enlisting the support of the news media. The Press particularly could be skeptical, if not dismissive, about CAM and the possible emergence of CBMs. It is therefore essential that their support is elicited, and that the intelligentsia be informed about OST/CAM through informed discussion and seminars.

6.4.7. Evaluation of Flight Procedures and Results

After the experimental flight is conducted, a joint committee would meet to evaluate the data collected and to discuss lessons learned. This committee would then make recommendations for a regular CAM regime.

6.5. Full-scale Implementation of CAM Regime

After conducting and evaluating the experimental flight (or more than one if required), India and Pakistan could look forward to the implementation of a full-scale CAM regime. At that stage, CAM flights would involve flying in one's own aircraft, on one's own side of the border, with observers from the other country on board. The observers would closely monitor the flight path of the aircraft and the functioning of the cameras. In order to assuage doubts and fears of the other side about the possibility of hidden sensing equipment being placed on board, both countries would conduct a joint pre-flight inspection of the monitoring aircraft. The platform height and sensor combination would ensure the desired resolution. Each party would receive a set of negatives and/or prints on completion of the mission.

The onus of ensuring a successful mission would be on the host country. A stand-by aircraft may have to be provided to anticipate equipment problems or malfunctions. This proposal is slightly different from existing OST procedures where, after the joint pre-flight inspection, the observer aircraft over-flies the observed country with the host's observers on board. This is possible only under circumstances of greater transparency and cooperation, but may be possible in India and Pakistan when their respective sensitivities are somewhat reduced.

The authors propose that CAM be conducted between September 1st and May 31st because this period is the typical "campaigning season" when troops of both countries are deployed for military exercises and training. During the span of this suggested nine-month period, two flights by each country are proposed. As confidence levels increase, a third "challenge" flight may be requested to allay suspicions, about a change in the military situation. The definition of a challenge flight is that either country may request that a monitoring flight is flown within a stipulated number of hours (to be mutually agreed upon by both countries) over a

specific area. By this time, it is hoped that both countries would have seen it fit to modify their own aircraft for conducting CAM flights. While the OST could provide helpful guidelines, Pakistan and India would create a master document for their unique CAM regime. Apart from participating in CAM, both countries would continue to conduct reconnaissance activity by use of their own NTMs to satisfy their own strategic and tactical requirements.

6.5.1. Resolution of Disagreements

An institutionalized infrastructure is required in order to arbitrate disputes that may arise especially in the early stages of the CAM regime. The Consultative Committee of Arbitration (CCA) would be comprised of a member each from India and Pakistan with the OSCC providing a permanent chairperson. Some typical disagreements that this committee could deal with are:

- Disputes arising out of non-compliance with CAM provisions.
- Resolution of ambiguities and differences over camera malfunctions, quality of film, flight diversions due to bad weather, or for other technical reasons.
- Determination of flight quotas or any other problems that may emerge. Because of the uncertain nature of disagreements that could arise, there can be no fixed template to resolve contentious issues. In the circumstances, it would be desirable for both countries to approach a problem with a spirit of cooperation and accommodation.

7. Recommendations

In order to give confidence building measures a chance to take root and succeed, this paper has made some recommendations that are repeated below as a ready reference. India and Pakistan should therefore consider implementing an incremental, minimally intrusive CAM regime as follows:

7.1. Short-Term Recommendations

- Begin the educational process by having both countries set up independent committees to study existing methods of CAM.
- Learn about operational considerations pertaining to CAM through study of existing models such as the Hungary-Romania accord and the Sinai Treaty. The OST document could provide necessary guidelines.
- Request observer status with the OST signatories in order to obtain experience and technology.
- Authorize inspectors from both countries to fly on board actual OST missions for training purposes.
- Request the availability of Third-Party aircraft in order to accomplish an experimental flight in a selected sector.
- Establish a hot line between the two air headquarters.
- Prepare the news media through briefings as to what CAM hopes to achieve.

7.2. Mid-Term Recommendations

- Sign a bilateral agreement for conducting an experimental flight.
- Inform air defense commands/organizations and troops in the field of impending experimental flight.
- Conduct the experimental overflight. Apply a modified version of CAM to one segment of the border covering a swath of 30 km, or, if the mission is flown along the border, to 15 km on either side of it.
- Modify each country's aircraft for use in conducting OST specifications within optical limits using a suitable camera.
- Meet to evaluate and resolve lessons learned.

7.3. Long-Term Recommendations

- Sign a bilateral agreement for a full CAM regime tailored to the unique circumstances of the India/Pakistan relationship.
- Expand CAM to cover the entire IB, except the Siachen, LOC, and Sir Creek areas.
- Evaluate role of CAM in existing and future military CBMs,
- Each country flies its own planes over its own territory.
- Consolidate and sustain political will for cooperation.
- Modify each country's aircraft to full OST capabilities to include SAR and IRLS equipment.
- Apply for full membership in OST.

8. Conclusion

Prolonged periods of suspicion and ongoing conflict have characterized the India-Pakistan relationship. Wars have not solved any problems that have prevailed between India and Pakistan. If anything, mutual distrust and paranoia have been exacerbated. This has in turn caused misery, suffering, and deprivation to a populace of over one billion. The presence of nuclear weapons in the subcontinent has raised the “peace-stakes” where even a minor confrontation could get out of hand and engulf the region, and perhaps even the world in a nuclear holocaust.

The OST has been cited as an example wherein military transparency has led to cooperation and understanding. Further, the bilateral CAM agreement between Hungary and Romania is also a case in point where when the will exists, technology can be a useful tool in resolving political issues amicably.

Declarations of the political leadership in the recent past demonstrate that the necessary political will is prevalent and is further testified by the long list of existing CBMs, some of which have been enumerated. With that in mind, the authors of this paper have dared to present an incremental CAM regime between India and Pakistan as a novel measure that would lead to further military confidence building measures. The proposal is intentionally narrow in scope in order to mitigate the abrasiveness on prevailing sensitivities.

The authors divided the nearly 3200-km-long border on the basis of unique geographical features to aid the analysis for technical and political feasibility of CAM. A short segment of the International Border has been proposed for demonstrating the applicability of the CAM regime. It has been suggested that in the initial stages, and specifically for the proposed experiment, assistance is obtained from countries that are signatories to the OST. Mechanisms and tools that are required have been listed, and the process of elimination applied to determine their suitability. A methodology for the application of our proposals has been indicated. This could be refined with experience.

We strongly urge that despite the knotty issue of Jammu and Kashmir begging resolution, an incremental approach to solving other contentious issues is applied. This would contribute in large measure towards building trust and confidence between India and Pakistan. The availability of weapons of mass destruction on both sides of the divide make it paramount that the people and the leadership of both countries display a desire to co-exist and live in peace for the sake of our peoples and future generations.

Glossary

Glasnost	Russian policy permitting open discussion of political and social issues and freer dissemination of news and information.
Infrared Line Scan	The ability to receive and visualize thermal radiation emitted in the infrared part of the electro-magnetic spectrum by objects due to their temperatures and in the absence of artificial illumination.
National Technical Means	All systems available to a country for strategic and tactical reconnaissance. It includes imagery as well as electronic intelligence from satellites, aircraft, and remotely piloted vehicles/UAVs.
Resolution	The quality of information extracted from remotely sensed images. It is the minimum distance on the ground between two closely located objects at which they are distinguishable as separate entities.
Synthetic Aperture Radar	SAR is a high-resolution ground-mapping technique that takes advantage of the forward motion of a vehicle. The imaging system has all-weather, day or night capability to “look” through clouds and smoke to detect, locate, classify, and sometimes identify ground targets.

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Air Marshal K.C. Cariappa (Retd) was commissioned into the Indian Air Force in May 1957. He participated in the Indo-Pak Wars of 1965 and 1971. He commanded a helicopter unit and a fighter squadron, and has served in various other command and staff appointments. He retired as Air Officer Commanding in Chief of Southwestern Air Command in January 1996.

Graduating from the Defence Services Staff College with an M Phil degree in Military Science, he attended a course at the Royal College of Defence Studies, London, in 1988.

His interests include wildlife and the environment, and his hobbies include trekking and angling. He lives in Madikeri, a small town in Karnataka State, India.

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